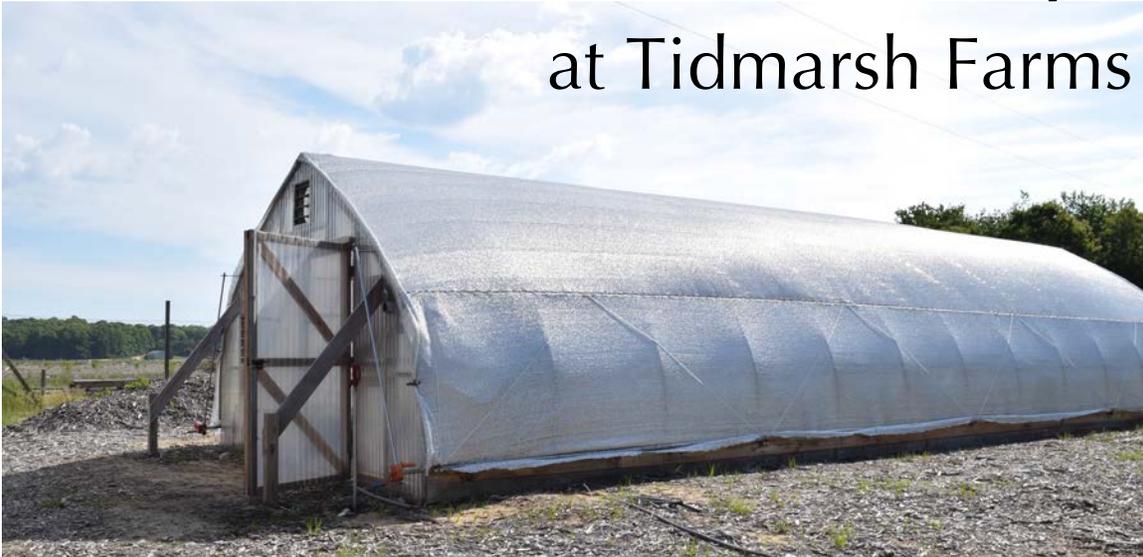


The Native Plant Nursery

at Tidmarsh Farms



BY EMMA ESTERMAN

Nestled on Tidmarsh Farms East is a greenhouse that has nurtured over 8,000 native plants of more than 150 different species. Among these plants are 18 different sedges, 7 species of oak, and 5 native willows. So how did such a robust native plant nursery sprout up among 250 acres of wetlands? The answer -- a dynamic combination of Tidmarsh directors and builders, a pair of botanists, and a few thousand Atlantic White Cedars (AWC).

For decades, Tidmarsh Farms grew cranberries. To maximize production of this monoculture, the land was reshaped and monotonized, in turn simplifying the biodiversity of the area. In 2010, the family owners of Tidmarsh Farms made a decision to take the land out of production, restore the wetlands, and transition the property into a nature sanctuary. Bountiful, diverse flora and fauna are hallmarks of a healthy wetland habitat. If left undisturbed, the owners feared that the site would recover very little of its potential biodiversity. As engineers planned the wetland restoration in 2011 and 2012, director Glorianna

Davenport and botanists Irina Kadis and Alexey Zinovjev decided to develop a native plant nursery that would ensure all new plantings in the restoration zone would be native species sourced from Plymouth County.

WHY BUILD A GREENHOUSE?

The idea of building a native plant nursery was initially inspired by the designers of the Tidmarsh Farms restoration who wanted to introduce AWC into the wetlands. The original restoration plan called for 6,800 AWC. The easiest and most reliable way to develop the AWC plant stock was to collect seed at the Eel River restoration in an adjacent watershed.

The project leaders purchased a greenhouse to provide a space to grow AWC seedlings, along with other native



Atlantic White Cedars growing in pots and raised beds in Glorianna's garden

plants. The materials for the greenhouse were ordered in the spring of 2014. The building was constructed on site by Brian Spires and Moses Lima who have worked with the Tidmarsh Farms team for many years.

The stratified portion of the first collection of AWC seed yielded over 5,000 seedlings in the early summer of 2014. While the greenhouse was not yet complete, this number of seedlings would have overwhelmed the greenhouse. Thus, 5,000 seedlings were driven to Tony Reiber's Northeast Native Habitats nursery in Montague, Massachusetts where Tony could grow the AWC until ready for planting. The remaining AWC were moved to space in Glorianna's garden. Moving the AWC to another location allowed the greenhouse team to focus on the cultivation of a broad spectrum of native plants in the nursery.

Growing plants from seed on a large scale would be difficult without a greenhouse. The controlled and sheltered environment of the greenhouse increases the chance of young plants' survival.

Raised tables, a hose, humidifier, and plastic film facilitate plant growth



Features of the greenhouse include: the film forming the roof and sides of the nursery that insulates plants against the cold by trapping in heat; adjustable sides that enable growers to regulate airflow, and, thus the temperature inside the greenhouse; and an irrigation system that dispenses water from spray nozzles, keeping the air humid and plants moist.

PATH OF THE PLANTS FROM GREENHOUSE TO FIELD

Some plants in the greenhouse originated from plants already growing on the Tidmarsh Farms property, a few ferns were ordered as bare root stock, and some willows were propagated through cuttings. However, the majority of plants in the greenhouse were meticulously grown from hand-collected seed.

Botanists Irina and Alexey travel across Massachusetts to observe plants in their native habitats. They identified which plants would be ideal for the restoration project, when they produce seed, and where they were located in order to collect seeds when ripe. With the help of greenhouse worker Claire Esterman, the seed was cleaned, sorted, counted, and stratified in preparation for germination. An electronic database designed by Alexey allowed everyone to track what and how much seed had been collected.

In the greenhouse, Claire, Glorianna, Irina, and Alexey monitor the growth of the plants, transplanting them into larger pots as needed. When the greenhouse began to run out of space for new plants, the largest, most established plants were moved onto a hill adjacent to the greenhouse. This extension of the nursery was tiered and irrigated to provide suitable growing conditions for the plants.



Plants growing in the pot nursery outside of the greenhouse

The cycle of collection, germination, transplanting, and re-locating plants has continued for over two years. Beginning in July 2016, SumCo, the restoration contractor, dispatched a planting crew. SumCo workers began planting the AWC from Sudbury Nursery West, Tidmarsh, and Northeast Nursery Habitats.

SumCo planter Josh plants AWC from Sudbury Nursery West



As time allowed, the SumCo team installed supplemental plantings for AWC pods (the name given to AWC planting areas), stream edges, ponds, and fens using plants from the nursery. Transitional areas were still too dry to plant in August, but will follow in the fall. Plants are released from the nursery based on plant deployment lists drafted by Glorianna, and moved to a deployment location by summer fellows Emma and Claire Esterman.



Plants deployed in the field (left), Claire checking deployment lists (upper right), SumCo workers loading AWC for deployment (lower right)



A leaf of a *Solidago latissimifolia* (Elliott's goldenrod) plant curling due to aphids

PEST PROBLEMS

The cultivation of so many native plants has not been without its challenges. Rodents chewed through the pots of some of the sedges that had over-wintered on the hill, damaging their roots. The surviving sedges had to be carefully repotted and nursed back to health by Claire, Irina, and Alexey.

In June, Glorianna noticed leaves were curling up and turning brown on some plants. Looking closely revealed black, brown, and green aphids that had camouflaged themselves on several species including *Bidens coronata* (crowned beggarticks) and *Asclepias incarnata* (swamp milkweed). Glorianna separated the afflicted plants from the healthy plants and applied a variety of insecticidal sprays and soaps until settling on Neem Oil as the most effective. Controlling the aphid epidemic proved difficult because as soon as one generation was extinguished, a new generation seemed to crop up, requiring repeated applications of Neem Oil.

The aphid epidemic coincided with an unusually large outbreak of gypsy moth caterpillars in Massachusetts. These caterpillars feed on and destroy deciduous plant matter and travel with the wind into the greenhouse. Part of Claire's daily routine was to check all of the oak seedlings in the greenhouse for gypsy moth caterpillars.

A gypsy moth caterpillar climbing on a *Quercus bicolor* (Swamp-white Oak)



SumCo received and began planting AWC trees at the height of this epidemic. Moments after the first trees were put in the ground, workers noticed many gypsy moth caterpillars climbing on the AWC. Project manager Alex Hackman halted further planting and sprayed all of the trees to eliminate the caterpillars. While it was not clear that the gypsy moth caterpillars would actually feed on the AWC, Alex and the planting crew did not want to take the risk. As the caterpillar season abated and planting resumed, SumCo installed plastic collars on each individual plant to protect them against rodents that may damage the trees in the coming seasons.

WHAT'S NEXT FOR THE NURSERY?

As more people understand the value of protecting and growing native plants, there should be more demand for many of the species currently grown at the nursery. In 2017, Tidmarsh Farms will grow plants for use in the project's second phase - the restoration of the property west of Beaver Dam Road referred to as Tidmarsh West. In addition, Tidmarsh Farms will donate over 100 plants grown in the nursery to the new Plymouth South High School. In 2018 and beyond, the Native Plant Nursery at Tidmarsh Farms will be available to grow plants for other restoration projects in Massachusetts.



The Native Plant Nursery has many more projects ahead of it



FEATURED SCIENTISTS: IRINA KADIS AND ALEXEY ZINOVJEV

Two Plymouth County native plant specialists, Irina Kadis and Alexey Zinovjev, served as the driving force behind Tidmarsh Farms' decision to build a native plant nursery. Irina and Alexey received their degrees from Saint Petersburg State University in Russia, moved to Massachusetts, and have since become authorities on the flora in Eastern Massachusetts.

When cultivating plants in the Tidmarsh Farms Nursery, Irina uses the skills and knowledge about plant propagation she has acquired from her work in the Dana Greenhouses at Harvard University's Arnold Arboretum. The Dana Greenhouses propagate and distribute all of the Arboretum's plant stock. At the Arboretum, Irina worked in the Greenhouses before migrating three years ago to the Curation Department -- the department in charge of plant records. Irina's experience growing and protecting plants at the Arboretum has proven to be a great asset to Tidmarsh Farms.

Together, Irina and Alexey run a website, Salicicola.com, that currently displays over 22,000 photographs of more than 1,500 vascular plant species in Eastern Massachusetts. Most of the photographs were taken by Alexey at the Blue Hills Reservation, Myles Standish State Forest (MSSF), Stony Brook Reservation, Middlesex Fells Reservation, Cutler Park, and Tidmarsh Farms, among

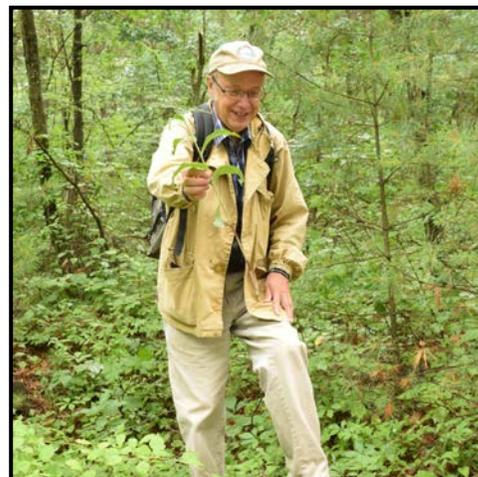
other locations. For many of these locations, Irina and Alexey have been developing inventories of every plant species present. They continually update their inventories by visiting the same sites multiple times throughout the year for many years.



Irina re-visiting a frost pocket in Myles Standish State Forest

These two botanists have been asked by the town and the Department of Conservation and Recreation to complete plant inventories and surveys of places such as the Six Ponds, Plymouth Long Beach, and Myles Standish State Forest. The results of these inventories give people a better idea of the plants growing in an area and shed light on how healthy areas are based on the ratio of native to non-native plants.

Alexey taking a photograph of a bladderwort species in the Blue Hills Restoration



Alexey collecting a sample to discuss in the Blue Hills Reservation

Irina and Alexey use their website Salicicola.com to provide the public with knowledge, resources, and tools to help them identify and learn about plants. This site features a photo search engine, enabling users to browse through the photo archive by scientific name, common name, location, or month. People can post photographs of plants they would like to identify at a special Q/A page: <http://fmssf.salicicola.com/questions>. The site also hosts fun, visual plant quizzes designed by Irina and Alexey. In addition, Irina and Alexey engage in public outreach through presentations, workshops, botanical walks as part of the Friends of the Myles Standish State Forest and Tidmarsh Farms, and answer plant queries for the Southeastern Massachusetts Pine Barrens.

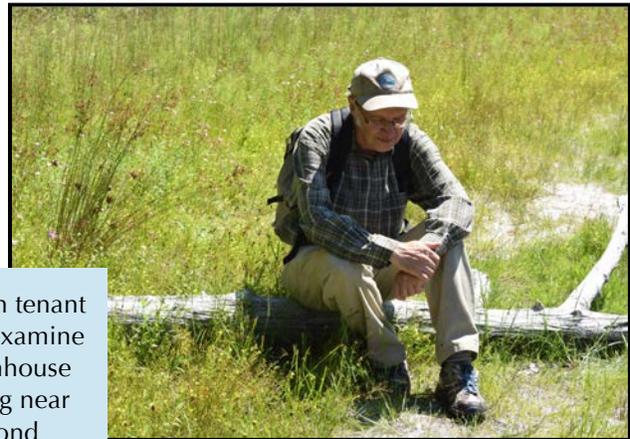
Irina leading a plant walk for the Friends of MSSF around Three-Cornered Pond



The botanists contribute their knowledge not only to the Massachusetts community, but internationally as well. Irina serves as editor for an international journal of salicology and plant biology, *Skvortsovia*. Both scientists have written articles, mostly about willows, and have translated Russian botanical publications into English to share knowledge from their native culture with English speakers.

Glorianna began working with Irina and Alexey in 2012 in order to create a plant inventory of Tidmarsh prior to the restoration. Over time they identified invasive species in addition to the native plants growing at Tidmarsh. Irina and Alexey were central to the decision to grow native plants for the restoration and build a greenhouse to raise them. Doing so provided Irina and Alexey with an arena in which to experiment, collect samples, and improve their knowledge of botany. Running the greenhouse requires a passion for plants, careful monitoring and years of hard work. As a result of this hard work, thousands of native plants will find their home at Tidmarsh Farms and beyond.

Irina and Alexey's commitment to protecting, learning about, and teaching others about plants has helped foster a more aware community and ensure the persistence of native species.



Irina and Tidmarsh tenant Charis Durrance examine plants in the greenhouse (top), Alexey sitting near Three-Cornered Pond (bottom)